From: Maria Martinez
To: R6_DWH_Info@epa.gov
Subject: Fw: Draft Response to E-mail Control on H2S Data
Date: 06/06/2010 09:21 AM

----- Forwarded by Maria Martinez/R6/USEPA/US on 06/06/2010 09:21 AM -----

From: Maria Martinez/R6/USEPA/US
To: Debbie Stackhouse/RTP/USEPA/US@EPA
Date: 06/05/2010 04:09 PM
Subject: Fw: Draft Response to E-mail Control on H2S Data

Debbie,

See below for the comments Deirdre sent to me this a.m.

Maria

Maria L. Martinez
Chief, Air Quality Analysis Section (PD-Q)
USEPA Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733
Telephone: 214-665-2230
Fax: 214-665-6762

----- Forwarded by Maria Martinez/R6/USEPA/US on 06/05/2010 04:08 PM -----

From: Deirdre Murphy/RTP/USEPA/US
To: Maria Martinez/R6/USEPA/US@EPA
Cc: Dave Guinnup/RTP/USEPA/US@EPA, Ruben Casso/R6/USEPA/US@EPA, Kelly Rimer/RTP/USEPA/US@EPA, Richard Wayland/RTP/USEPA/US@EPA, Bill Lamason/RTP/USEPA/US@EPA
Date: 06/05/2010 11:04 AM
Subject: Fw: Draft Response to E-mail Control on H2S Data

Hi Maria,

I'm just sending a couple of thoughts that might help in addressing the comments the team has sent yesterday and this am. Like Dave, I also do not know where the "physical reactions limit" that the email cites comes from. But one approach is to reiterate in the response that some people will notice H2S at levels well below the various exposure levels.
Also, I would avoid calling the AEGL a screening level as it's really an emergency planning level, and it's a level where effects are estimated to occur (vs not). I've pasted the paragraph below and put in red the sentences where I'm providing some text to illustrate an approach you might want to consider.

There are 3 permanent ambient air monitoring sites upwind of New Orleans that the Louisiana Department of Environmental Quality (LDEQ) has been operating for several years. These stationary monitors are located in: one monitor in Meraux, Louisiana and two in Chalmette, Louisiana. The maximum concentration that has been recorded at the Meraux monitor to date has been 19 parts per billion (ppb) and at the Chalmette sites the highest concentration recorded has been 11 ppb. These values for 1-hour samples are well below the 1-hour acute exposure guideline level (510 ppb), which is a level above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects.

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Additionally, these LDEQ 1-hour measurements are also well below levels developed by the U.S. ATSDR (Agency for Toxic Substances and Disease Registry) for exposures longer than 1 hour (e.g., lasting a few weeks or several months). ATSDR's levels are estimated to be below levels that might cause adverse health effects in the people most sensitive to such chemical-induced effects. The odor of hydrogen sulfide is noticeable, however, to some people at levels as low as 0.5 ppb.

You might also considering providing this link to ATSDR's FAQs on H2S for the general public: http://www.atsdr.cdc.gov/toxfaqs/TF.asp?id=388&tid=67 - or even attach the pdf of it that they make available on this site.

And in case it's useful, here's the link to ATSDR's more technical ToxGuide for H2S: http://www.atsdr.cdc.gov/toxguides/toxguide-114.pdf

Deirdre

----- Forwarded by Deirdre Murphy/RTP/USEPA/US on 06/05/2010 11:32 AM -----

From: Maria Martinez/R6/USEPA/US

To: EOC OAR@EPA

Cc: Alan Rush/DC/USEPA/US@EPA, Alison Davis/RTP/USEPA/US@EPA, Andrea Drinkard/DC/USEPA/US@EPA, Beth Craig/DC/USEPA/US@EPA, Bill Lamason/RTP/USEPA/US@EPA, Carl Edlund/R6/USEPA/US@EPA, Carol Kemker/R4/USEPA/US@EPA, Daniel Garver/R4/USEPA/US@EPA, Darren Palmer/R4/USEPA/US@EPA, Dave Guinnup/RTP/USEPA/US@EPA, Dave Mickunas/RTP/USEPA/US@EPA, Dave Wright/ERT/R2/USEPA/US@EPA, David Mintz/RTP/USEPA/US@EPA, Deirdre Murphy/RTP/USEPA/US@EPA, Donnette Sturdivant/R4/USEPA/US@EPA, Doug Neeley/R4/USEPA/US@EPA, Drew McConville/DC/USEPA/US@EPA, Earl Bozeman/R4/USEPA/US@EPA, Egide Louis/R4/USEPA/US@EPA, Janet McCabe/DC/USEPA/US@EPA, Jim Afghani/R6/USEPA/US@EPA, John Cardarelli/CI/USEPA/US@EPA, Joseph-J Dougherty/DC/USEPA/US@EPA, Kelly Rimer/RTP/USEPA/US@EPA, Lance McCluney/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA, Louise Camalier/RTP/USEPA/US@EPA, Mark Sather/R6/USEPA/US@EPA, Markj Thomas/R7/USEPA/US@EPA, Richard Wayland/RTP/USEPA/US@EPA, Ruben Casso/R6/USEPA/US@EPA, Solomon Pollard/R4/USEPA/US@EPA, Tim Hanley/RTP/USEPA/US@EPA, Todd Rinck/R4/USEPA/US@EPA, Van Shrieves/R4/USEPA/US@EPA, weinstock.lewis@epa.gov, R6_DWH_Info@epa.gov

Date: 06/04/2010 02:33 PM

Subject: Draft Response to E-mail Control on H2S Data

All,

The attached file contains Region 6's draft response to the e-mail control received concerning H2S data. Also attached is the original e-mail correspondence.

The control response is due on June 9th.

Maria

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[attachment "Draft Email Response to Genevieve Tyrrelll06-04-10.doc" deleted by Deirdre Murphy/RTP/USEPA/US]

[attachment "AX-10-000-8248 Tyrrell - H2S New Orleans.pdf" deleted by Deirdre

Murphy/RTP/USEPA/US]

Agency for Toxic Substances & Disease Registry

ToxFAQs™ for Hydrogen Sulfide

(*Ácido Sulfhídrico*)

July 2006

CAS# 7783-06-4

PDF Version, 36 KB

This fact sheet answers the most frequently asked health questions about hydrogen sulfide. For more information, you may call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

top

Highlights

Hydrogen sulfide occurs naturally and is also produced by human activities. Just a few breaths of air containing high levels of hydrogen sulfide gas can cause death. Lower, longer-term exposure can cause eye irritation, headache, and fatigue. Hydrogen sulfide has been found in at least 35 of the 1,689 National Priorities List sites identified by the U.S. Environmental Protection Agency (EPA).

top

What is hydrogen sulfide?

Hydrogen sulfide (H_2S) occurs naturally in crude petroleum, natural gas, volcanic gases, and hot springs. It can also result from bacterial breakdown of organic matter. It is also produced by human and animal wastes. Bacteria found in your mouth and gastrointestinal tract produce hydrogen sulfide from bacteria decomposing materials that contain vegetable or animal proteins. Hydrogen sulfide can also result from industrial activities, such as food processing, coke ovens, kraft paper mills, tanneries, and petroleum refineries.

Hydrogen sulfide is a flammable, colorless gas with a characteristic odor of rotten eggs. It is commonly known as hydrosulfuric acid, sewer gas, and stink damp. People can smell it at low levels.

top

What happens to hydrogen sulfide when it enters the environment?

- Hydrogen sulfide is released primarily as a gas and spreads in the air.
- Hydrogen sulfide remains in the atmosphere for about 18 hours.

- When released as a gas, it will change into sulfur dioxide and sulfuric acid.
- In some instances, it may be released as a liquid waste from an industrial facility.

top

How might I be exposed to hydrogen sulfide?

- You may be exposed to hydrogen sulfide from breathing contaminated air or drinking contaminated water.
- Individuals living near a wastewater treatment plant, a gas and oil drilling operation, a farm with manure storage or livestock confinement facilities, or a landfill may be exposed to higher levels of hydrogen sulfide.
- You can be exposed at work if you work in the rayon textiles, petroleum and natural gas drilling and refining, or wastewater treatment industries. Workers on farms with manure storage pits or landfills can be exposed to higher levels of hydrogen sulfide.
- A small amount of hydrogen sulfide is produced by bacteria in your mouth and gastrointestinal tract.

top

How can hydrogen sulfide affect my health?

Exposure to low concentrations of hydrogen sulfide may cause irritation to the eyes, nose, or throat. It may also cause difficulty in breathing for some asthmatics. Brief exposures to high concentrations of hydrogen sulfide (greater than 500 ppm) can cause a loss of consciousness and possibly death. In most cases, the person appears to regain consciousness without any other effects. However, in many individuals, there may be permanent or long-term effects such as headaches, poor attention span, poor memory, and poor motor function. No health effects have been found in humans exposed to typical environmental concentrations of hydrogen sulfide (0.00011–0.00033 ppm).

Scientists have no reports of people poisoned by ingesting hydrogen sulfide. Pigs that ate feed containing hydrogen sulfide experienced diarrhea for a few days and lost weight after about 105 days.

Scientists have little information about what happens when you are exposed to hydrogen sulfide by getting it on your skin, although they know that care must be taken with the compressed liquefied product to avoid frost bite.

top

How likely is hydrogen sulfide to cause cancer?

Hydrogen sulfide has not been shown to cause cancer in humans, and its possible ability to cause cancer in animals has not been studied thoroughly. The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have not classified hydrogen sulfide for carcinogenicity.

top

How does hydrogen sulfide affect children?

Children are likely to be exposed to hydrogen sulfide in the same manner as adults, except for

adults at work. However, because hydrogen sulfide is heavier than air and because children are shorter than adults, children sometimes are exposed to more hydrogen sulfide than adults. Health problems in children who have been exposed to hydrogen sulfide have not been studied much. Exposed children probably will experience effects similar to those experienced by exposed adults. Whether children are more sensitive to hydrogen sulfide than adults or whether hydrogen sulfide causes birth defects in people is not known.

top

How can families reduce the risk of exposure to hydrogen sulfide?

Families can be exposed if they live near natural or industrial sources of hydrogen sulfide, such as hot springs, manure holding tanks, or pulp and paper mills. Families may want to restrict visits to these places.

top

Is there a medical test to show whether I've been exposed to hydrogen sulfide?

Hydrogen sulfide can be measured in exhaled air, but samples must be taken within 2 hours after exposure to be useful. A more reliable test to determine if you have been exposed to hydrogen sulfide is the measurement of thiosulfate levels in urine. This test must be done within 12 hours of exposure. Both tests require special equipment, which is not routinely available in a doctor's office. Samples can be sent to a special laboratory for the tests. These tests can tell whether you have been exposed to hydrogen sulfide, but they can not determine exactly how much hydrogen sulfide you have been exposed to or whether harmful effects will occur.

top

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set an acceptable ceiling limit for hydrogen sulfide of 20 parts hydrogen sulfide per 1 million parts of air (20 ppm) in the workplace.

The National Institute for Occupational Safety and Health (NIOSH) recommends a 10-minute ceiling limit of 10 ppm in the workplace.

top

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2006. Toxicological Profile for Hydrogen Sulfide. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

top

Where can I get more information?

ATSDR can tell you where to find occupational and environmental health clinics. Their

specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

For more information, contact:

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Environmental Medicine
1600 Clifton Road NE, Mailstop F-62
Atlanta, GA 30333
Phone: 1-800-CDC-INFO · 888-232-6348 (TTY)
FAX: 770-488-4178
Email: cdcinfo@cdc.gov

top

- Page last reviewed: September 1, 2010
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- Content source: Agency for Toxic Substance and Disease Registry

The ToxGuide™ is developed to be used as a pocket guide. Tear off at perforation and fold along lines.

Sources of Exposure

General Populations

- There are natural and anthropogenic sources of hydrogen sulfide. It is generated by bacteria in the mouth and gastrointestinal tract during the metabolism of sulfhydryl-containing amino acids (e.g., cysteine).
- Hydrogen sulfide occurs naturally in the gases from volcanoes, sulfur springs, swamps, and stagnant bodies of water.
- Hydrogen sulfide is released by a number of industries pulp and paper mills, natural gas production, swine containment and manure handling, or geothermal power plants.
- For the general population, exposure to hydrogen sulfide most likely occurs through inhalation of ambient air.

Occupational Populations

- Facilities where hydrogen sulfide is produced, used, or generated include petroleum refineries, natural gas plants, petrochemical plants, coke oven plants, kraft paper mills, viscose rayon manufacturing plants, sulfur production plants, iron smelters, food processing plants, manure treatment facilities, landfills, textile plants, waste water treatment facilities, and tanneries.

Toxicokinetics and Normal Human Levels

Toxicokinetics

- Hydrogen sulfide is readily and rapidly absorbed through the lungs. It can also be absorbed through the gastrointestinal tract and skin, but there are limited data for these routes.
- Absorbed hydrogen sulfide is rapidly distributed throughout the body.
- It is metabolized through three pathways: oxidation, methylation, and reactions with metalloproteins or disulfide-containing proteins.
- Sulfate metabolites are excreted in the urine. In a human study, peak levels of urinary thiosulfate occurred 15 hours after an acute exposure.

Normal Human Levels

- Hydrogen sulfide is produced in the mouth; concentrations ranging from 1 to 100 ppb have been measured in mouth air.
- Hydrogen sulfide can compose up to 10% of intestinal gases. Hydrogen sulfide concentrations as high as 18 ppm were measured in the flatus of individuals on a normal diet.
- Sulfide concentrations in blood samples from six adults ranged from 0.3 to 3 µg/mL.

Biomarkers/Environmental Levels

Biomarkers

- Urinary thiosulfate levels can be used as biomarker of exposure. However, it is not unique to hydrogen sulfide exposure.

Environmental Levels

Air

- Ambient air concentrations range from 0.11 and 0.33 ppb; in urban areas concentrations are generally <1 ppb.
- Much higher concentrations (often exceeding 90 ppb) have been detected in communities located near natural sources or industries releasing hydrogen sulfide.

Sediment and Soil

- No data are available for hydrogen sulfide levels in soil.
- Levels in undisturbed anoxic sediment may be as high as 100 ppb and levels in disturbed sediments range from 1-30 ppb.

Water

- Hydrogen sulfide readily evaporates from surface water.
- No data are available for hydrogen sulfide levels in drinking water.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2006. Toxicological Profile for Hydrogen Sulfide. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

ToxGuide™ for Hydrogen Sulfide H_2S

CAS# 7783-06-4

July 2006

U.S. Department of Health and Human Services
Public Health Service
Agency for Toxic Substances and Disease Registry
www.atsdr.cdc.gov

Contact Information:
Division of Toxicology
and Environmental Medicine
Applied Toxicology Branch

1600 Clifton Road NE, F-32
Atlanta, GA 30333
1-800-CDC-INFO
1-800-232-4636
www.atsdr.cdc.gov/toxpro2.html

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Chemical and Physical Information

Hydrogen Sulfide is a Gas

- Hydrogen sulfide is a flammable, colorless gas with a characteristic odor of rotten eggs.
- It can dissolve in water where it will dissociate into bisulfide ion and sulfide ion.
- Hydrogen sulfide can form insoluble sulfide salts with various metals (i.e., copper, zinc, nickel, iron) that may be present in the soil or water.
- There is considerable individual variability in the odor threshold for hydrogen sulfide in humans; the thresholds can range from 0.0005 to 0.3 ppm. However, at high concentrations individuals may lose their ability to smell it. This can make hydrogen sulfide very dangerous.

Routes of Exposure

- Inhalation – The primary route of exposure for the general population and workers.
- Oral and Dermal – Minor routes of exposure; these routes only contribute a small amount to the overall body burden

Hydrogen Sulfide in the Environment

- Hydrogen sulfide is produced naturally and as a result of human activity.
- Natural sources (e.g., gases from volcanoes, sulfur springs, swamps) account for about 90% of the hydrogen sulfide in the atmosphere.
- It can be released to the environment by various industries including natural gas production, municipal sewage pumping and treatment plants, swine containment and manure-handling operations, animal slaughter, facilities, tanneries, petroleum refining, and pulp and paper operations.

Relevance to Public Health (Health Effects)

Health effects are determined by the dose (how much), the duration (how long), and the route of exposure.

Minimal Risk Levels (MRLs)

Inhalation

- An MRL of 0.07 ppm has been derived for acute-duration inhalation exposure (≤14 days).
- An MRL of 0.02 ppm has been derived for intermediate-duration inhalation exposure (15-364 days).
- A chronic-duration inhalation MRL was not derived for hydrogen sulfide.

Oral

- No acute-, intermediate-, or chronic-duration oral MRLs were derived for hydrogen sulfide.

Health Effects

Respiratory

- Nasal symptoms, sore throat, cough, and dyspnea has been observed in humans exposed to hydrogen sulfide.
- Impaired lung function has been observed in asthmatics.
- Damage to the nasal olfactory epithelium appears to be the most sensitive respiratory effect in animals.

Neurological

- Exposure to high levels of hydrogen sulfide results in unconsciousness followed by apparent recovery, colloquially referred to as knockdown. Some individuals report permanent or persistent neurological effects after the apparent recovery.
- Impaired performance on neurological tests has been observed in animals exposed to lower concentrations of hydrogen sulfide.

Children's Health

- It is not known if children are more susceptible to hydrogen sulfide poisoning than adults.